JOINT USERS RESOURCE ALLOCATION PLANNING COMMITTEE

Thursday, May 15, 2008, 1 - 2pm. PDT

JPL - Building 126, Room 200

Telecon Line – (818) 354-2626

AGENDA

1. **Introductory Remarks..... D. Morris**

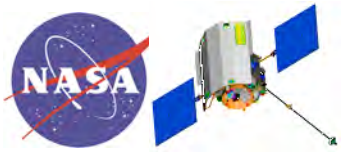
2. **Conflict Resolution ..... D. Morris**

3. **Action Items – DSN Customer Forum ..... D. Morris**

4. **SPECIAL REPORTS:**
   MESSENGER Mercury Swingby #2 ..... K. Williams

5. **Resource Analysis Team ..... E. Martinez**

   - **Mid-Range Status**
   - **Proposed DSS Downtime Status ..... D. Dillard**
   - **DSS-34 Azimuth Track Repair/ Ka-Band Phase 2: Two Week Extension October 2008**
   - **Special Studies**

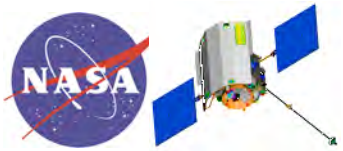


MESSENGER Navigation for Mercury 2 Flyby

Ken Williams
Navigation Team Chief

KinetX, Inc.

kenneth.williams@kinetx.com
805-791-8094

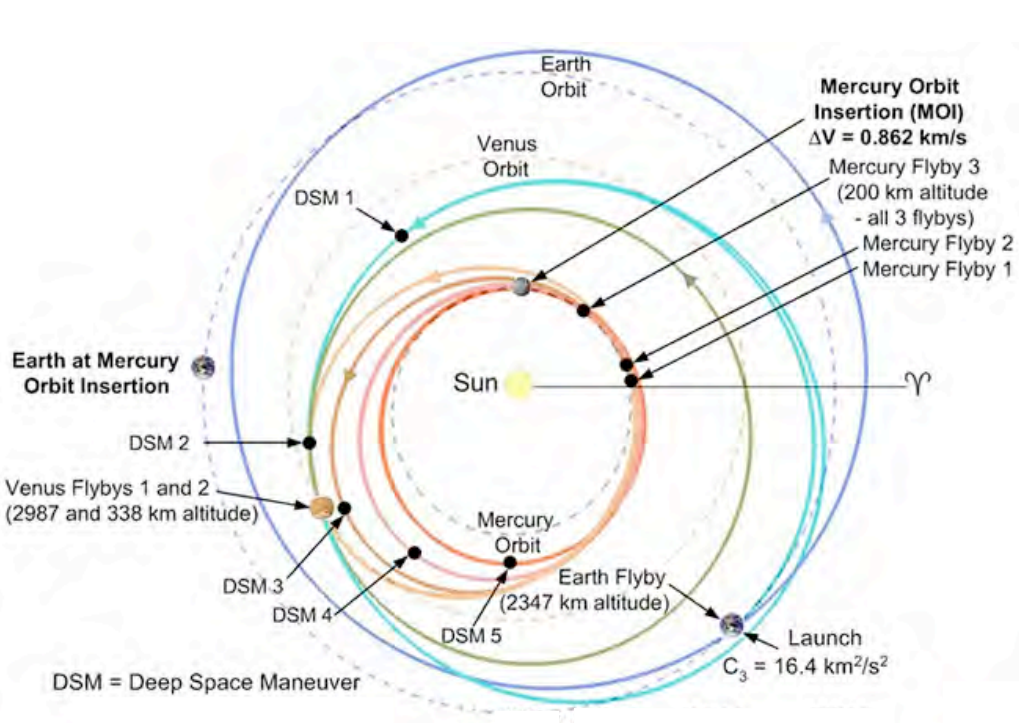


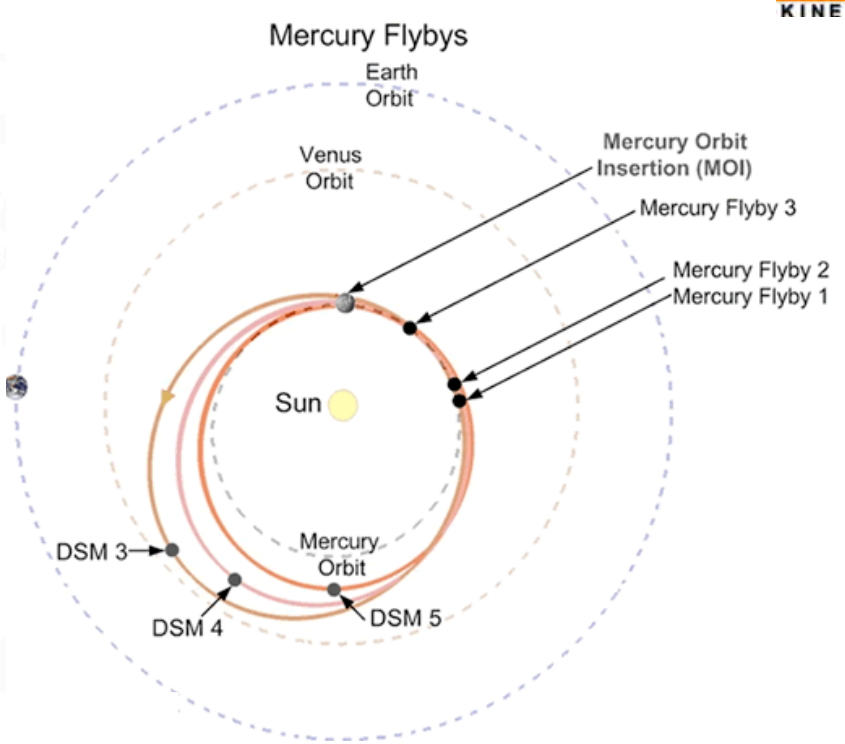
MESSENGER
Topics

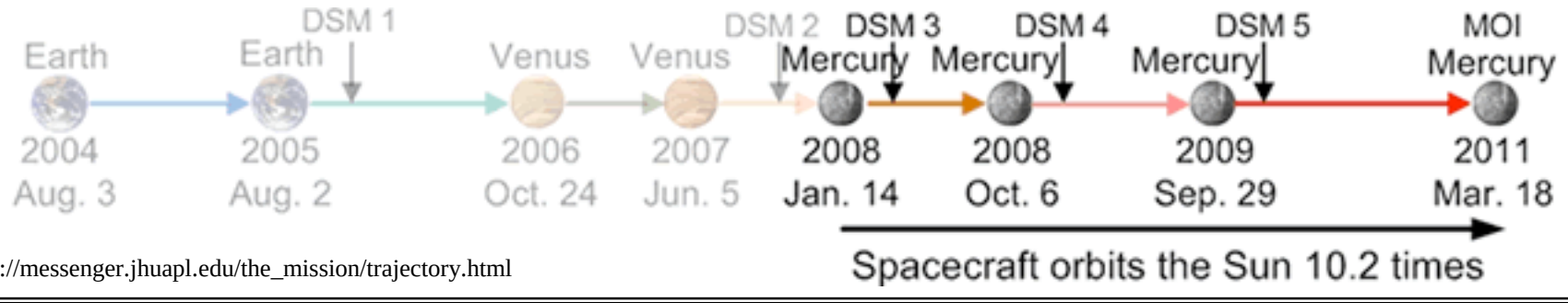
- Heliocentric Trajectory
- Encounter Geometry
- Delivery Errors and Costs
- Navigation Considerations
- Delta-DOR Timeline
- Doppler/Ranging Timeline
- Summary

MESSENGER

Heliocentric Trajectory



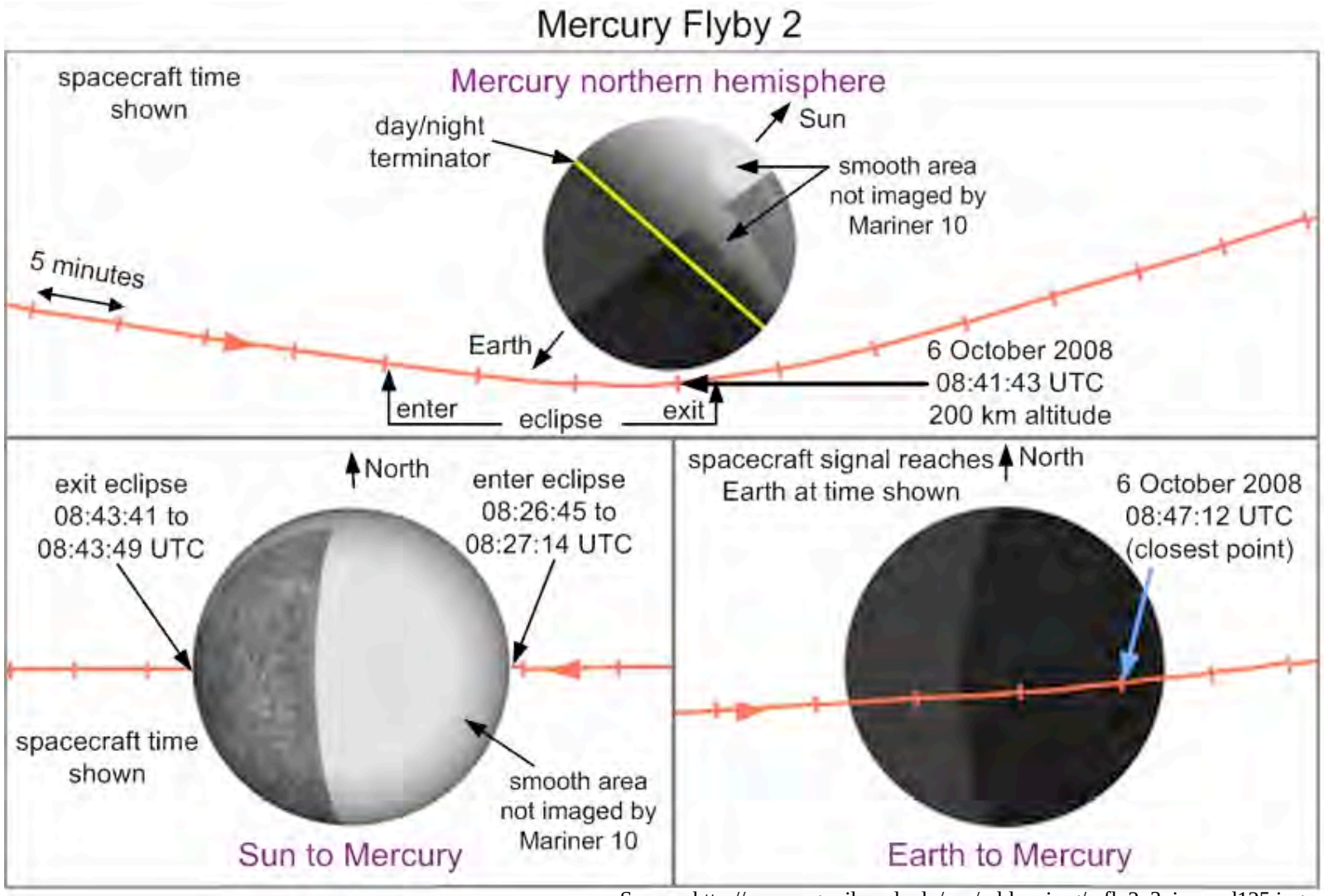




Source: http://messenger.jhuapl.edu/the_mission/trajectory.html

MESSENGER

Encounter Geometry



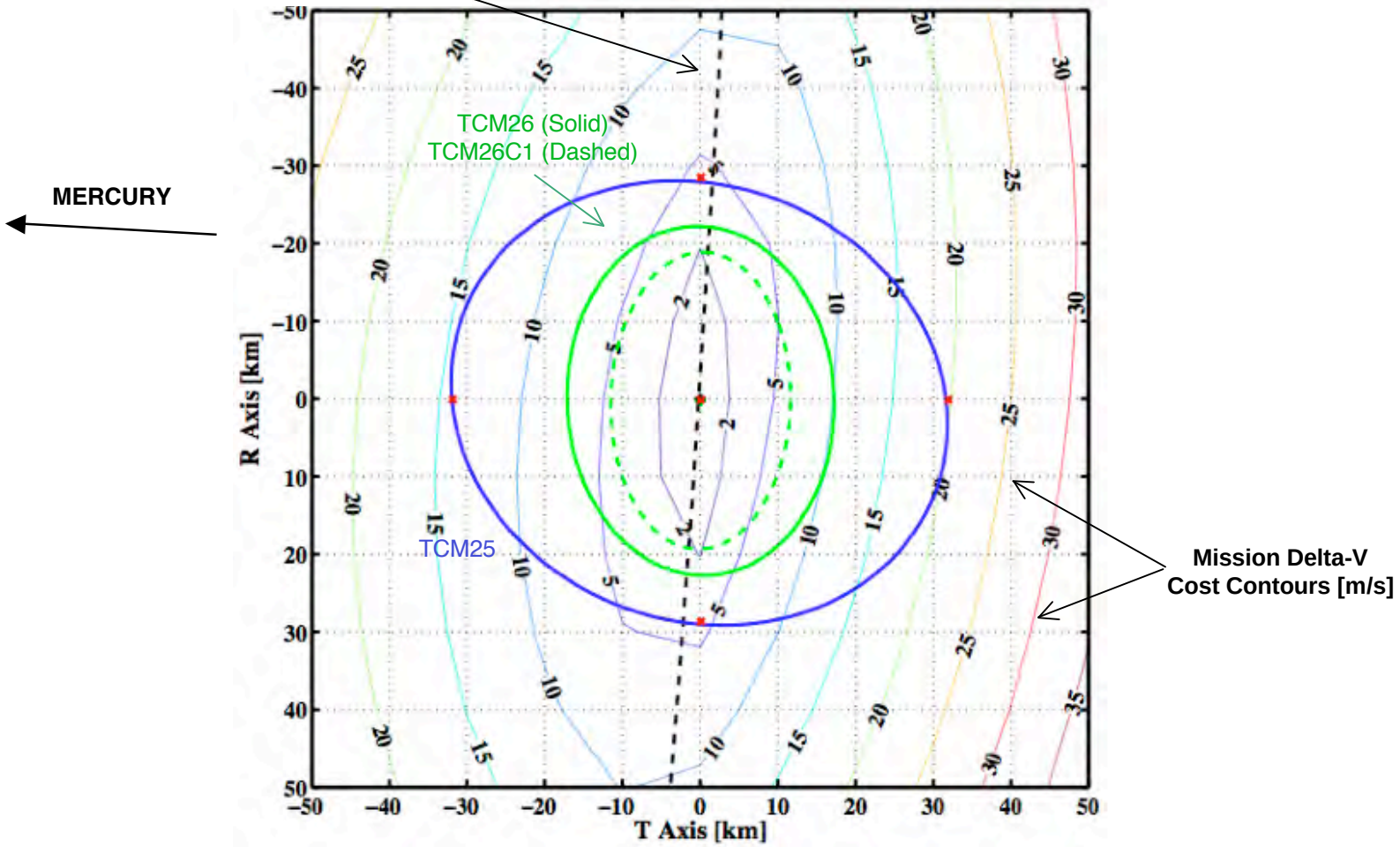
Source: http://messenger.jhuapl.edu/soc/reldoc_img/mfly2_3view_od125.jpg

NOTE: Actual times may vary - Dependent on OD changes, spacecraft attitude and TCMs

MESSENGER

Delivery Errors and Costs

Mercury 2 Baseline



Delivery Error (3-Sig)	a [km]	b [km]	Orient [deg]	LFT [sec]
TCM25	32.5	28.1	20	27.5 (948)
TCM26	22.5	17.2	87.5	10.5 (948)
TCM26C1	19.1	11.5	-89	9.33 (948)

Navigation Considerations

What's Different about Mercury 2 Versus Mercury 1?

- DSM for M1-M2 Leg Already Completed with Excellent Outcome
  - ~10 cm/sec at TCM-25 (Aug 28 or M2 - 39d) to achieve M2 targeted aimpoint
  - TCM-25 or subsequent TCM- 26 might be reduced or eliminated altogether by "solar sailing" sufficiently close to aimpoint
- DE405 Mercury Ephemeris Verified
  - Difference of only ~2 km established after M1 Reconstruction
  - OpNavs demoted from critical operations to tests until Mercury orbit in 2011
  - Need for close-in TCM-27 eliminated
- No Long Solar Conjunctions
  - Superior Conjunction (SEP < 3 deg) 4-8 June (non-critical period)
  - Inferior Conjunction (SEP 2-3 deg) 6-7 October (around encounter, but little or no degradation in tracking data)
- No Earth Occultation
  - Had been out of contact about 48 min for Mercury 1
- Closest Heliocentric Range Yet
  - Down to ~0.3 AU after flyby

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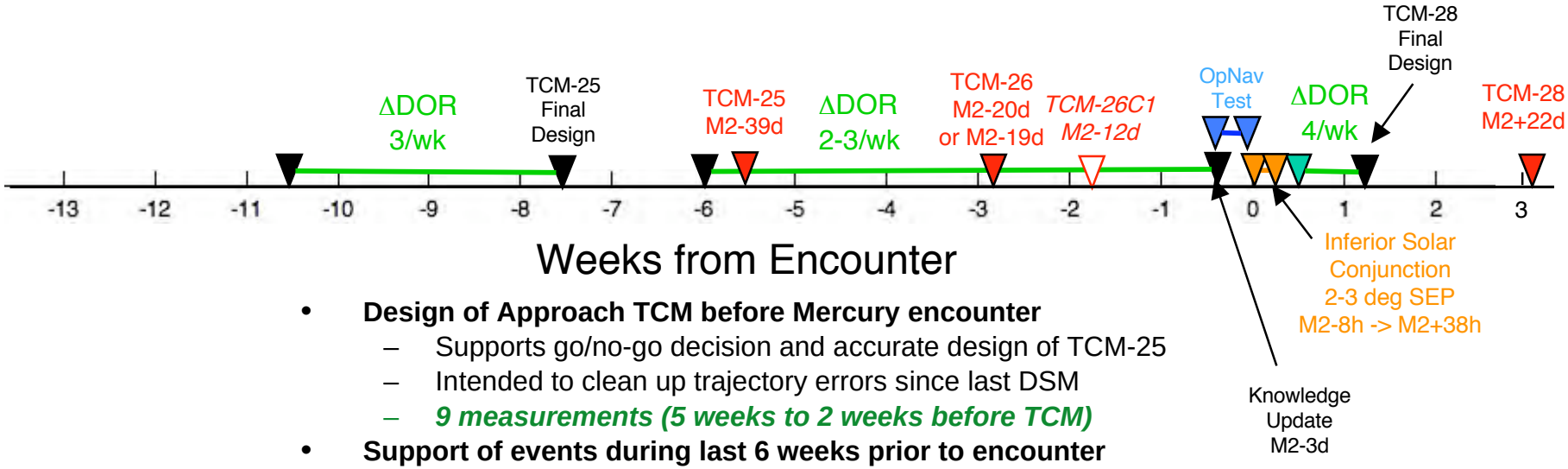
Delta-DOR Requirements

Proposed Delta-DOR Schedule for Mercury 2 Approach



- **Design of Approach TCM before Mercury encounter**
  - Supports go/no-go decision and accurate design of TCM-25
  - Intended to clean up trajectory errors since last DSM
  - ***9 measurements (5 weeks to 2 weeks before TCM)***
- **Support of events during last 6 weeks prior to encounter**
  - Reconstruction of TCM, go/no-go decision, design and reconstruction of any maneuvers remaining before M2
  - ***18 measurements (M2 – 6 weeks to M2 – 3.25 days; reducible if TCM cancelled)***
- **Encounter reconstruction and support of post-encounter cleanup maneuver**
  - Determines outbound trajectory and cleanup of encounter errors at TCM-28
  - ***4 measurements (M2 + 3 days to M2 + 9 days)***
- **Delta-DORs should be balanced between each DSN baseline and not bunched up**
  - ***As shown with 50% Goldstone-Madrid and 50% Goldstone-Canberra***

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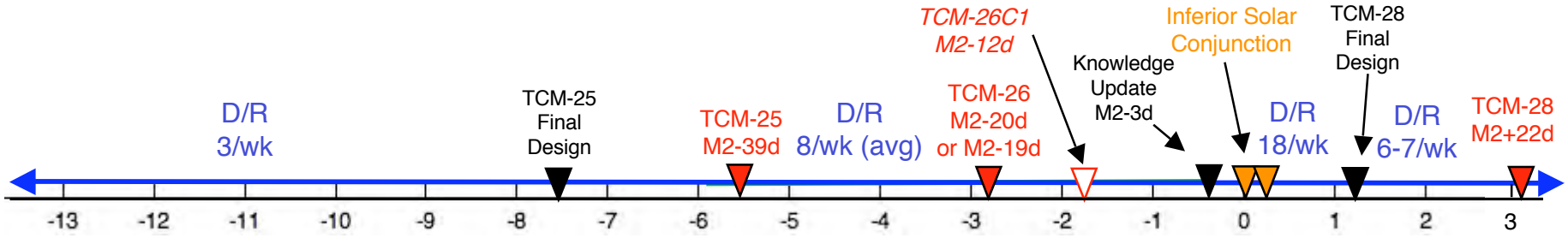
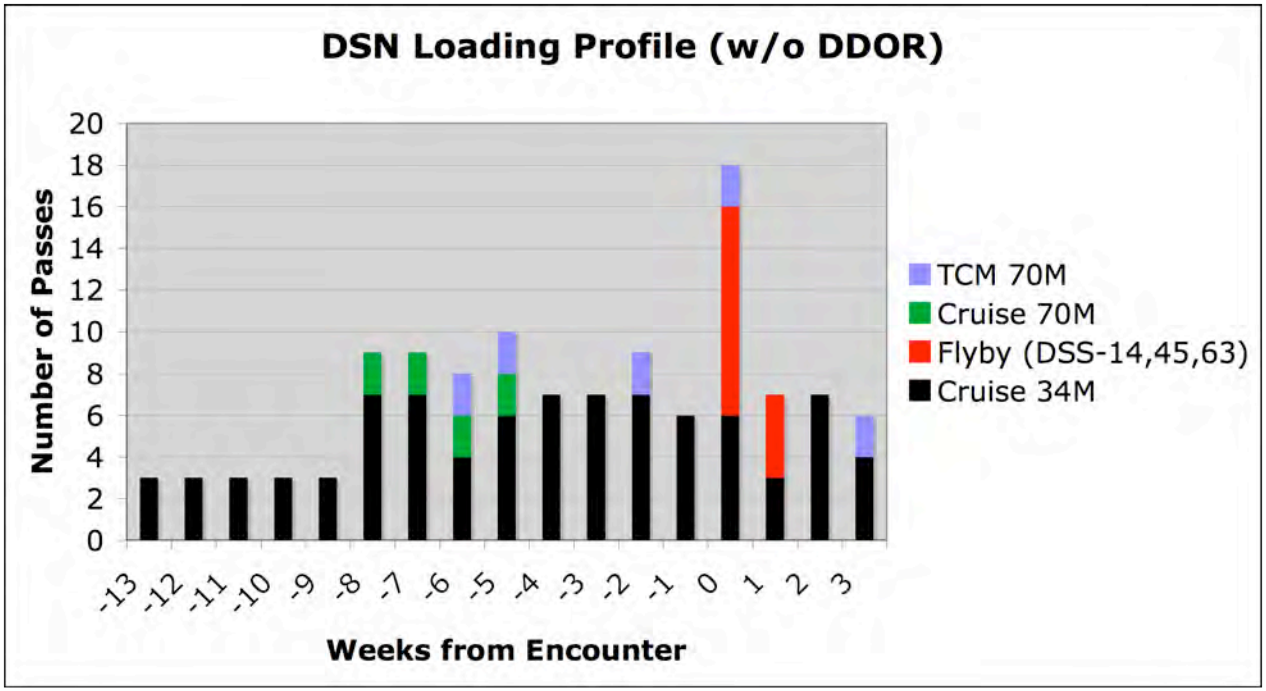
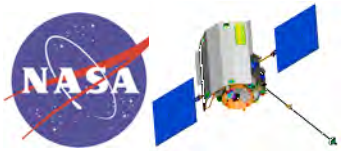
Doppler-Ranging Requirements

Proposed Doppler/Ranging Schedule for Mercury 2 Approach



Weeks from Encounter





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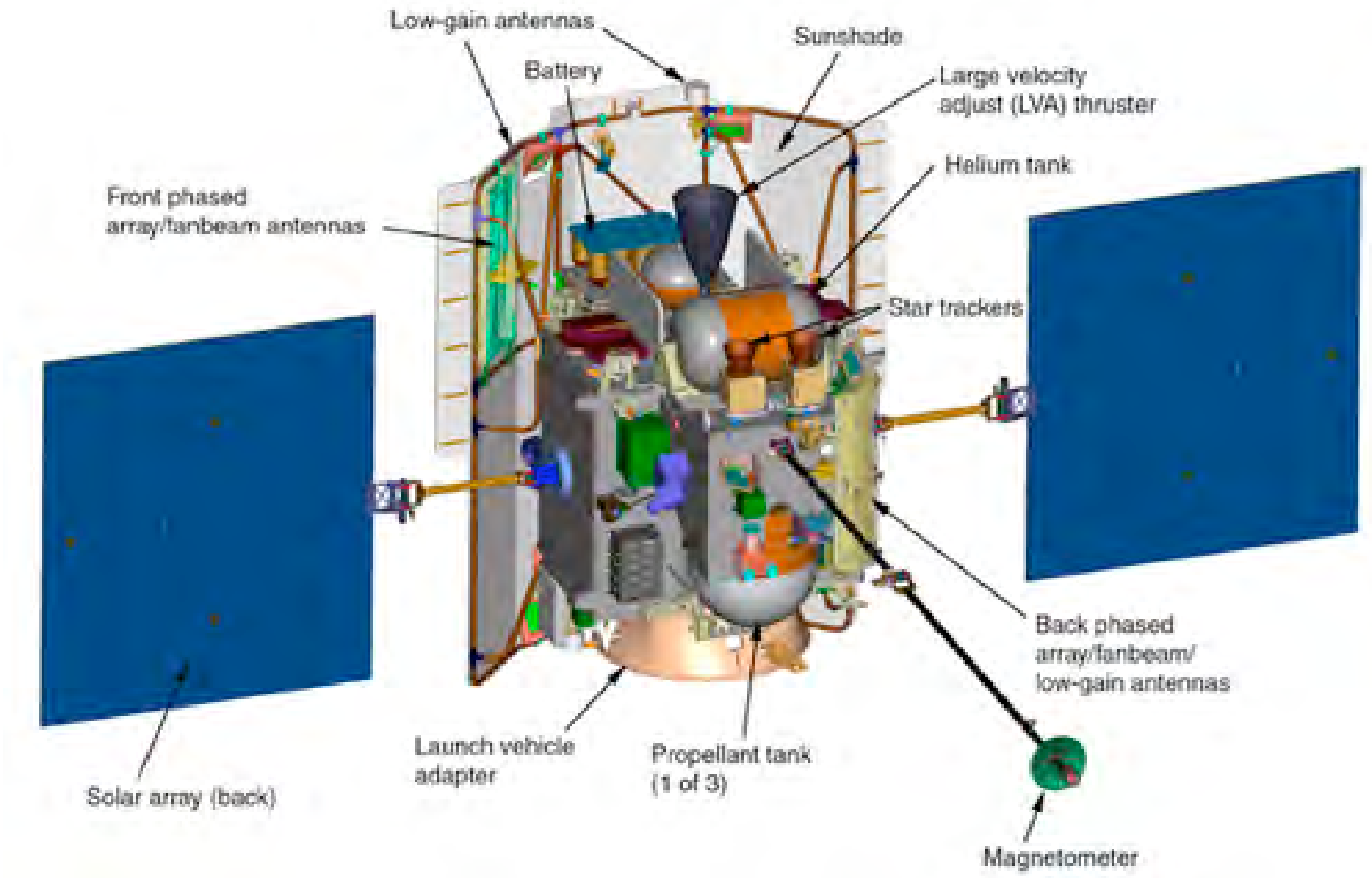
Summary

- Adequate Delta-DOR and Doppler/ranging tracks to support accurate flyby trajectory reconstruction
- Projected delivery errors and costs relatively benign
- Specific Navigation recommendations:
  - Do not change planet ephemeris (stay with DE405 for operations prior to Mercury orbit in 2011)
  - Perform OpNavs as tests to further develop and refine capabilities leading eventually to landmark tracking in Mercury orbit in 2011
  - Attempt attitude adjustments to “sail” sufficiently close to the target, but leave approach maneuver opportunities in place for now
    - Delete TCM-27 (no late update)
    - Move TCM26 farther out and add TCM26C1 (contingency)
    - If approach maneuver required, keep option open to adjust Mercury TCA to allow completely lateral (or radial) implementation
- See http://messenger.jhuapl.edu for more information

Backup Slides

MESSENGER

Spacecraft Overview



Source: http://messenger.jhuapl.edu/spacecraft/index.html

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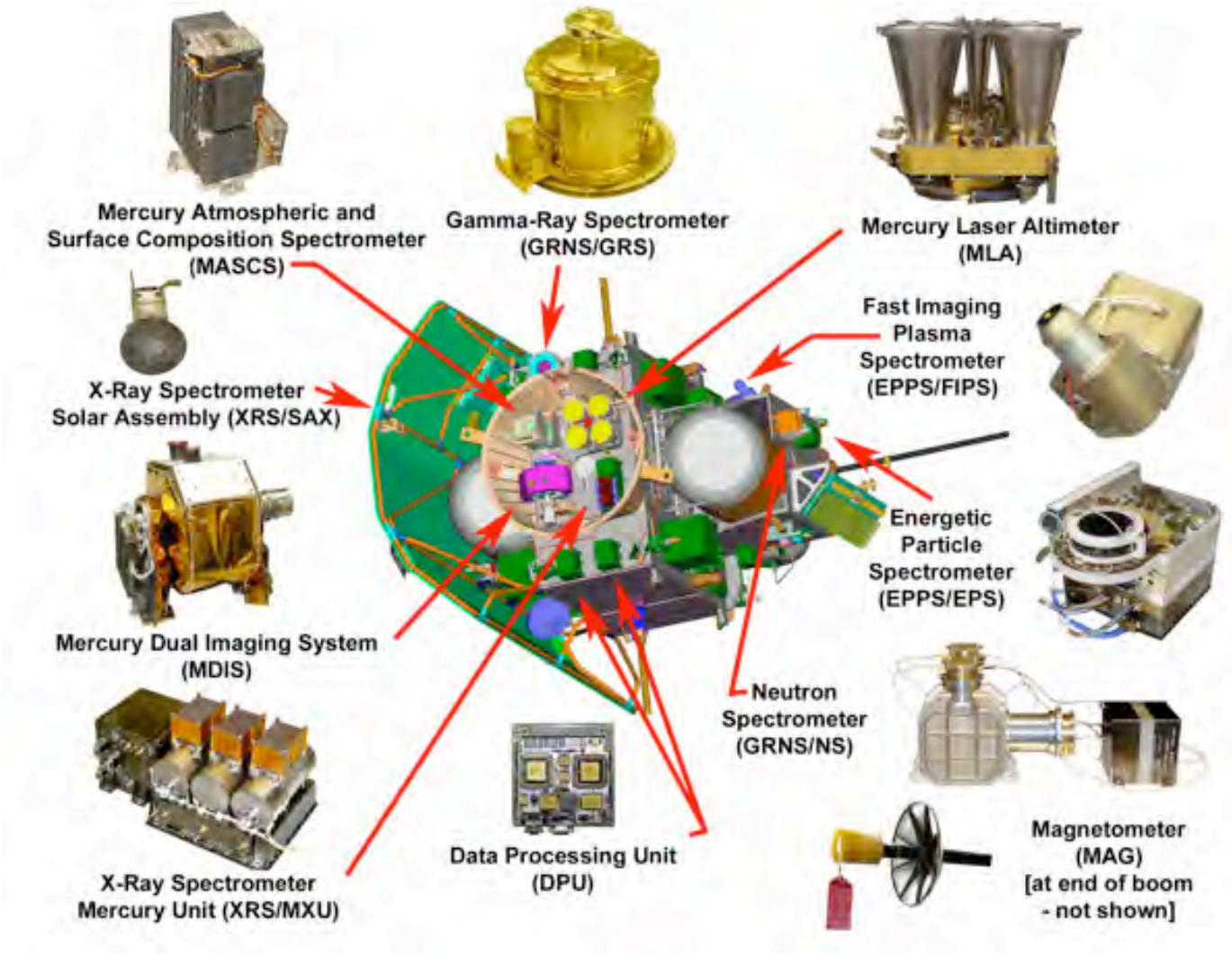
Instrument Overview



Source: http://messenger.jhuapl.edu/instruments/index.html

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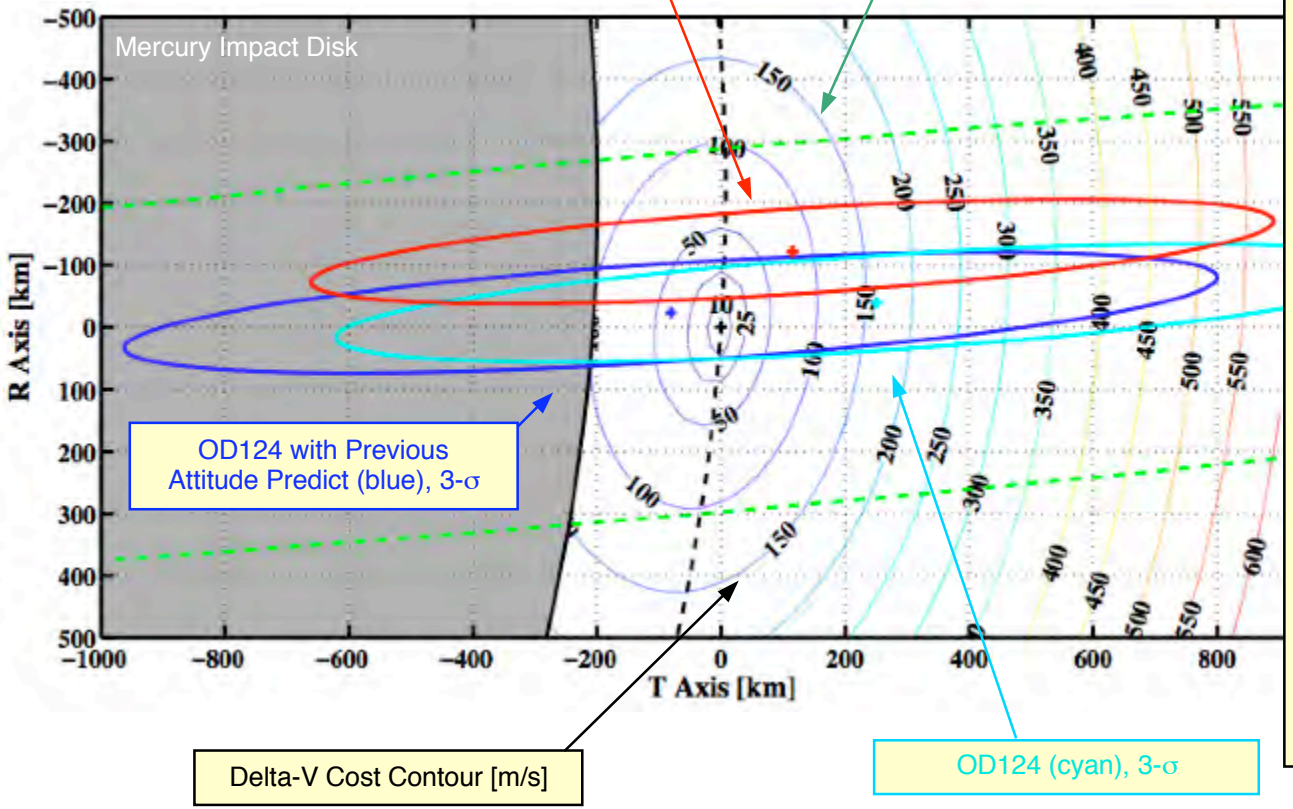
Mercury B-plane as of 10 April 2008

Mercury B-plane (06-Oct-2008, EMO2000)



Positions, Times, 3-σ Errors

- **Pre-DSM-3 Nominal Delivery Prediction:**
  - B•T, B•R = 3349, 220 km
  - Ellipse: 4050 x 291 km, -5 deg
  - TCA: 08:40:00.7 ET ± 48 min
- **Nav OD124 (02 Apr 2008):**
  - B•T, B•R = 3600, 181 km
  - Ellipse: 873 x 77 km, -4 deg
  - TCA: 08:38:03.7 ET ± 466s
- **Nav OD124 with Previous Attitude Predict:**
  - B•T, B•R = 3268, 196 km
  - Ellipse: 883 x 79 km, -4 deg
  - TCA: 08:40:58.5 ET ± 471s
- **Nav OD125 (10 Apr 2008):**
  - B•T, B•R = 3464, 98 km
  - Ellipse: 778 x 68 km, -4 deg
  - TCA: 08:39:15.7 ET ± 414s
- **reop021a Target ([0,0] on Plot):**
  - B•T, B•R = 3349, 220 km (Aimpoint)
  - TCA: 08:42:48.1 ET

Proposed Mercury 2 OpNav Test

- **General Characteristics**
  - Slightly Reduced Number of OpNav Images
    - 8 OpNav events vs. 9 for M1
    - Still 8 images per event
  - Relatively More Compressed Observation Schedule
    - First image after M2-3.3d (> 40 deg off Sun)
    - Last image much closer to Encounter than M1 (~M2-15h)
    - After last pre-encounter Delta-DOR
  - Relatively More Relaxed Processing Schedule
    - OpNav activity now passive (testing) rather than active (part of critical operations)
    - Therefore, no specific turn-around requirement
    - Playback of images according to priorities established by Science

- **Schedule**

OpNav #	DOY	Date (UTC)	Start Time (UTC)	Start Relative to Encounter (hrs)
1	277	3-Oct-2008	3:30	-77
2	277	3-Oct-2008	16:00	-65
3	278	4-Oct-2008	4:00	-53
4	278	4-Oct-2008	12:00	-45
5	278	4-Oct-2008	20:00	-37
6	279	5-Oct-2008	4:00	-29
7	279	5-Oct-2008	12:00	-21
8	279	5-Oct-2008	18:00	-15

Mercury 2 OpNav Test Sequence

- **General Characteristics**
  - 8 Images taken in as rapid succession as possible
  - Spacecraft attitude settled and recorded as quaternion at time image shuttered
  - Pivot angle fixed for entire sequence
  - Auto-exposure parameters based on DN levels instead of exposure times per recommendation of MDIS Team
- **Specific Requirements**

Image #	Include Star*	Include Mercury	Camera	Exposure	DPU Binning	Filter	Note
1	Yes	No	NAC	10 sec	1x1	Clear	Star within 5-10 deg of planet
2	Yes	No	NAC	10 sec	2x2	Clear	and 20 pixels of boresight
3	Yes	No	NAC	10 sec	2x2	Clear	Offset 10 pixels to observe star relative to camera noise
4	No	Yes	NAC	≤2400 DN (auto)	1x1	Clear	Planet within 20 pixels of
5	No	Yes	NAC	≤1400 DN (auto)	1x1	Clear	boresight
6	Yes	Yes	WAC	10 sec	1x1	Clear	Same attitude and pivot
7	Yes	Yes	WAC	≤2400 DN (auto)	1x1	Clear	angle; minimize time between
8	Yes	Yes	WAC	≤1400 DN (auto)	1x1	Clear	WAC images

*Star to Target:

OpNav #	Star ID (Tycho Catalog)	Visual Magnitude
1	1396-02758-1	3.9
2	1396-02758-1	3.9
3	1396-02758-1	3.9
4	1960-01550-1	3.0
5	1960-01550-1	3.0
6	1396-02758-1	3.9
7	1960-01550-1	3.0
8	1960-01550-1	3.0

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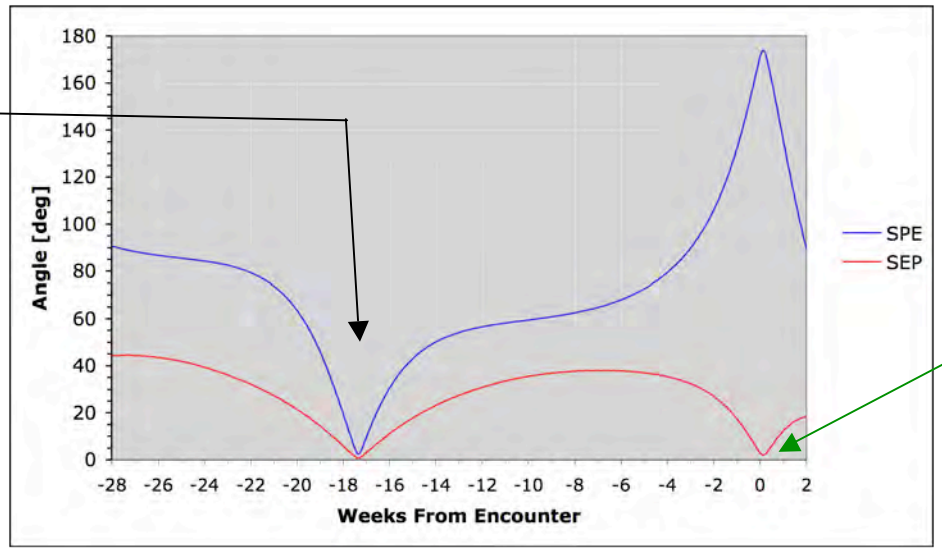
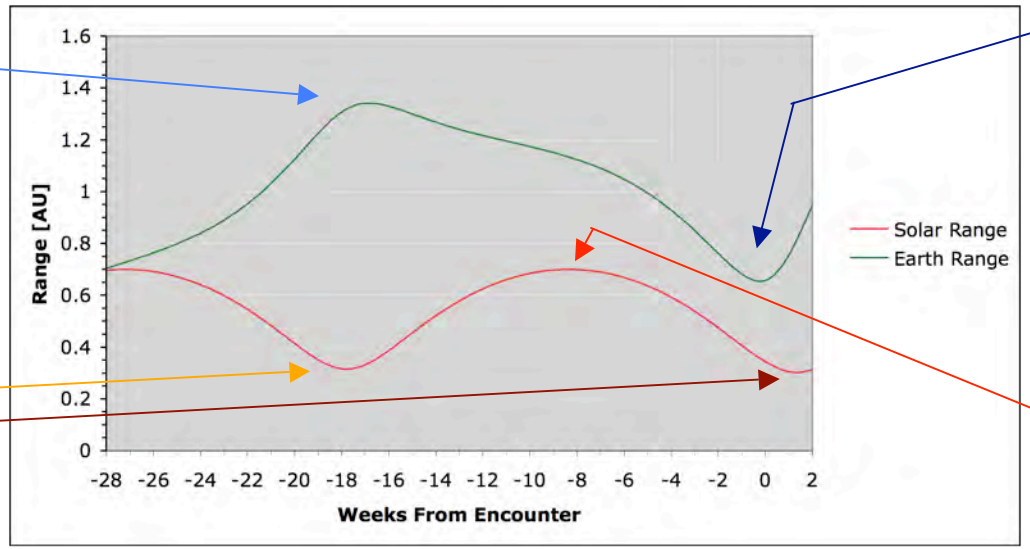
Sun-Earth Geometry Over Remainder of M1-M2 Leg

Superior Solar Conjunction
4-8 June 2008
(SEP ≤ 3 deg)



Inferior Solar Conjunction
6-7 Oct 2008
M2-8h -> M2+38h
(2-3 deg SEP)

Maximum Earth Range
9 June 2008
(1.341 AU)



Minimum Earth Range
4 Oct 2008
(0.654 AU)

Perihelia:
- 3 June 2008 (0.316 AU)
- 15 Oct 2008 (0.302 AU)

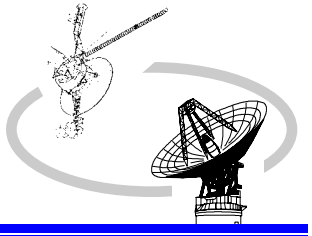
Aphelion
8 Aug 2008
(0.700 AU)

JOINT USERS RESOURCE ALLOCATION PLANNING COMMITTEE

Resource Analysis Team

May 15, 2008

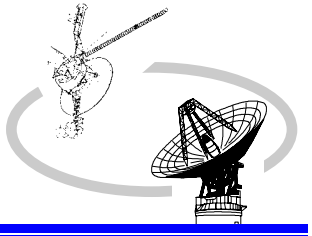
LaMont Fairley



MID-RANGE SCHEDULING STATUS

- **RESOURCE NEGOTIATION STATUS**
  - 2008 WEEKS 30 - 31 (THRU 08/03/2008) HAVE BEEN RELEASED TO DSN SCHEDULING AS OF 05/15/2008.
  - 2008 WEEKS 37 - 38 (THRU 09/21/2008) WERE RELEASED TO THE REMOTE USERS ON 05/02/2008.
  - 2008 WEEKS 32 - 36 (THRU 09/07/2008) HAVE REMAINING FACILITY AND EQUIPMENT CONFLICTS.

- The Mid-Range Scheduling process has schedule 20 weeks ahead of real-time. Currently, there are 11 weeks of conflict-free schedules. Conflict Resolution is required for the following three weeks: 09/01/2008 through 09/21/2008.



ON-GOING SPECIAL STUDIES/ACTIVITIES

MSL

– Shift for MSL TCM-2 to the December 4, 2009 to February 4, 2010 timeframe, depending on actual launch day.

Summary

– Analysis results reveal that should TCM-2 shift to the requested timeframe, it would have some 70M contention. Primarily, this is with Odyssey and MRO and should be negotiable.

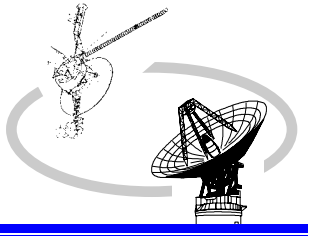
– Completed two special studies for future proposed missions

– Just as a reminder for all Projects and Missions:
The deadline to submit responses is on or before May 30th for the August DSN Resource Allocation Forecast Review.

see the link below for details:

http://rapweb.jpl.nasa.gov/RAR-RedAug2008.html

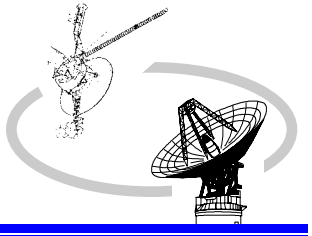
Resource Allocation Planning Service (RAPS)



– Ongoing / Approved Projects –

Project	Acronym	Launch or Start	EOPM	EOEM
DSN Antenna Calibration	DSN	--	--	--
DSS Maintenance	DSS	--	--	--
DSN ZDD Calibration	DSN	--	--	--
Reference Frame Calibration (Cat M&E and Clock Sync)	DSN	10/01/01	09/30/20	12/31/30
Voyager 2	VGR2	08/20/77	10/15/89	12/31/13
Voyager 1	VGR1	09/05/77	12/31/80	12/31/13
Goldstone Solar System Radar	GSSR	10/01/88	09/30/20	12/31/30
European and Global VLBI Systems	EGS	10/01/88	09/30/20	12/31/30
Ulysses	ULYS	10/06/90	09/11/95	09/30/10
Geotail	GTL	07/24/92	07/24/95	10/01/09
Space Geodesy Programme	SGP	05/01/93	09/30/20	12/31/30
Wind	WIND	11/01/94	11/01/97	11/30/11
Ground Based Radio Astronomy	GBRA	10/01/95	09/30/20	12/31/30
SOHO	SOHO	12/02/95	05/02/98	12/31/11
Polar	POLR	02/22/96	08/23/97	04/30/08
Advanced Composition Explorer	ACE	08/25/97	02/01/01	08/31/11
Advanced Tracking and Observational Techniques (ATOT)	ATOT	10/01/97	09/30/20	12/31/30

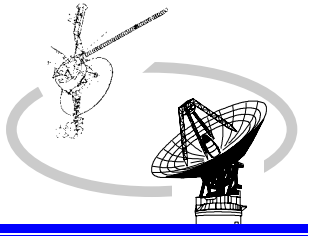
Resource Allocation Planning Service (RAPS)



– Ongoing / Approved Projects –

Project	Acronym	Launch or Start	EOPM	EOEM
Cassini	CAS	10/15/97	06/30/08	06/30/10
Chandra X-Ray Observatory	CHDR	07/23/99	09/30/14	09/30/19
Cluster 2 - S/C #2 (Samba)	CLU2	07/16/00	02/15/03	09/30/11
Cluster 2 - S/C #3 (Rumba)	CLU3	07/16/00	02/15/03	09/30/11
Cluster 2 - S/C #1 (Salsa)	CLU1	08/09/00	02/15/03	09/30/11
Cluster 2 - S/C #4 (Tango)	CLU4	08/09/00	02/15/03	09/30/11
Mars Odyssey 2001	M01O	04/07/01	08/24/04	12/31/10
Wilkinson Microwave Anisotropy Probe	WMAP	06/30/01	10/01/03	09/30/10
International Gamma Ray Astrophysics Lab	INTG	10/17/02	12/18/04	12/31/12
Hayabusa (MUSES - C)	MUSC	05/09/03	06/10/10	- - -
Mars Express Orbiter	MEX	06/02/03	02/11/06	05/01/09
Spirit (Mars Exploration Rover - A)	MER2	06/10/03	04/06/04	09/30/08
Opportunity (Mars Exploration Rover - B)	MER1	07/07/03	04/27/04	09/30/08
Spitzer Space Telescope (SIRTF)	STF	08/25/03	05/31/09	05/31/14
Rosetta	ROSE	02/26/04	12/31/15	- - -
Messenger	MSGR	08/03/04	03/19/12	- - -
Mars Reconnaissance Orbiter	MRO	08/12/05	12/31/10	12/31/15

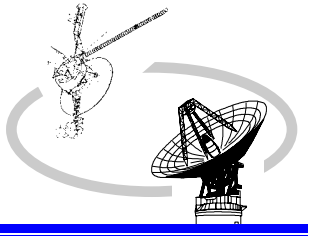
Resource Allocation Planning Service (RAPS)



– Ongoing / Approved Projects –

Project	Acronym	Launch or Start	EOPM	EOEM
Venus Express	VEX	11/09/05	09/24/07	05/01/09
New Horizons	NHPC	01/19/06	04/17/16	TBD
Stereo Ahead	STA	10/26/06	01/22/09	01/22/12
Stereo Behind	STB	10/26/06	01/22/09	01/22/12
EPOxI (Deep Impact)	DIF	07/03/07	12/14/10	- - -
NExT (Stardust)	SDU	07/03/07	02/27/11	- - -
Phoenix	PHX	08/04/07	08/31/08	10/30/08
Kaguya (SELENE)	SELE	09/14/07	11/21/08	TBD
Dawn	DAWN	09/27/07	07/04/15	TBD
Chandrayaan - 1	CH1	04/09/08	04/09/09	04/09/10
GOES-O	GO14	11/05/08	04/21/13	TBD
Lunar Reconnaissance Orbiter	LRO	11/24/08	11/30/09	TBD
Lunar Crater Observation and Sensing Satellite (LCROSS)	LCRO	11/24/08	02/05/09	- - -
Kepler	KEPL	02/16/09	09/16/12	TBD
Mars Science Laboratory 2009	MSL	09/15/09	03/04/12	TBD

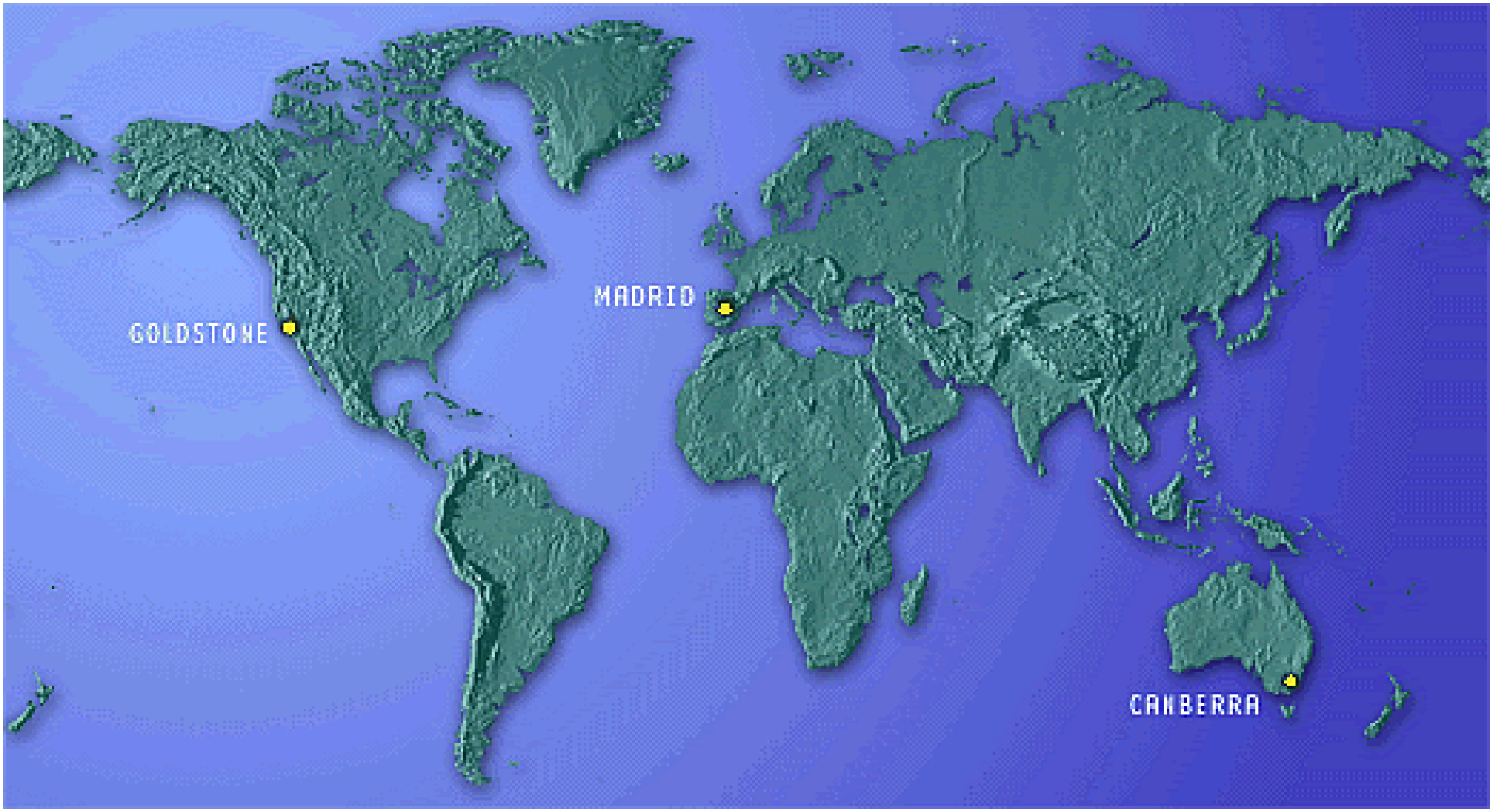
Resource Allocation Planning Service (RAPS)



– Advanced / Planning Projects –

Project	Acronym	Launch or Start	EOPM	EOEM
Juno	JUNO	08/08/11	10/20/18	TBD
Gravity Recovery and Interior Laboratory-A (GRAIL-A)	TBD	09/09/11	05/27/12	TBD
Gravity Recovery and Interior Laboratory-B (GRAIL-B)	TBD	09/09/11	05/27/12	TBD
Discovery-13	TBD	01/01/13	TBD	TBD
James Webb Space Telescope	JWST	06/15/13	02/28/19	TBD
Mars Scout 2013 (TBS)	M13S	10/31/13	12/30/16	TBD
Magnetospheric Multiscale	MMS	10/01/14	12/31/17	TBD
Discovery-14	TBD	01/01/15	TBD	TBD
New Frontiers-3	TBD	01/01/15	TBD	TBD
Outer Planet-1	TBD	01/01/15	TBD	TBD
Beyond Einstein-1	TBD	01/01/16	TBD	TBD
Discovery-15	TBD	01/01/17	TBD	TBD

DSN Antenna Downtime Status and Forecast



http://rapweb.jpl.nasa.gov/planning

Antenna Downtime Status and Forecast

The following downtimes are being studied for 2008 - 2010

- SPC-60 is requesting additional time for Commercial Power Installation no earlier than July 8, 2008. They are requesting 2 three day blocks or 3 two day blocks on off shift hours.
- SPC-40 is requesting complex downtime for A Station Power Grid.
  - Week 22 DOY 153 2200-0200 scheduled
  - Week 34 DOY 237 2200-0600 proposed
  - Week 38 DOY 265 2200-0400 proposed
  - Week 39 DOY 272 2200-0400 proposed
- DSS-14 Grouting for week 31 in 2008 for 3 - 5 days.
  - The grouting has been placed in the schedule and all conflicts have been resolved.
- DSS-14 Grouting has been proposed for week 35 in 2008 for 3 days.
- DSS-14 Grouting has been proposed for week 44 in 2008 for 3 days.
- DSS-55 downtime for Paint Repair beginning in June 2008 has been moved to September weeks 36 - 41.
- DSS-54 downtime for ACQ Aid Installation is scheduled for October, weeks 42 and 43 of 2008.
  - Due to Cassini critical support, the proposed downtime DOYs would be 287 – 290 and 292 – 294. Will check for TERRA views. Cassini view is 0400-1600 will check on actual time needed.
- DSS-43 downtime for Life Extension and Depot Level Maintenance starting October 3, 2008 has been moved to start January 5, 2009 and proposed to end April 12, 2009 weeks 2 – 15 which add an extra two weeks to the end time.
- DSS-63 downtime for Life Extension has been shortened to May 4, through August 2, 2009, weeks 19 - 31.
- DSS-24 downtime for painting has been proposed for April – May of 2009, weeks 14 - 22. A study is being performed.

Antenna Downtime Status and Forecast

The following downtimes are being studied for 2008 - 2010

- DSS-34 downtime for Azimuth Track Replacement has been proposed for 2010, local summer.
  - It is suggested to move to October, November of 2009 weeks 41-47.
- DSS-65 downtime for Life Extension Elevation for October, November of 2009 has been proposed for weeks 31 - 41 in 2010.
- As a result of the reduction of downtime for DSS-43 & DSS-63 in 2008 & 2009, it is requested to recover that time in 2010, local spring, summer or fall after DSS-14 RTS.
  - DSS-43 is proposed for August 30 to November 29, 2010 weeks 35-48
  - DSS-63 is proposed for February 28 to May 29, 2011 weeks 9 -21.
- DSS-15 downtime for Pintle Bearing has been proposed for May 3, through June 27, 2010, weeks 18 - 25.

Antenna Downtime Status and Forecast

Downtime request for 2008

The following proposals for 14 hour complex downtimes are requested by GDSCC.

- Corrective maintenance “G86/G81 Transfer Switch Electrical Maintenance” in May has been changed to NET September 2008.
  - This was in the schedule for week 22 DOY 147/0830-2230. This downtime will be scheduled no earlier than week 36 and negotiated in the Mid-Range negotiation meetings.
- Preventative maintenance “G91 2400V Switchgear Electrical Maintenance” in June has been changed to NET September 2008.
  - This is in the schedule for no earlier than week 38 and will be negotiated in the Mid-Range negotiation meetings.
- Preventative maintenance “Echo Tie-Line Electrical Maintenance” in September has been changed to NET October 2008.
  - This is in the schedule for no earlier than week 40 and will be negotiated in the Mid-Range negotiation meetings.
- Preventative maintenance “Apollo Tie-Line Electrical Maintenance” in October has been changed to NET November 2008.
  - This is in the schedule for no earlier than week 43 and will be negotiated in the Mid-Range negotiation meetings.
- Preventative maintenance “SPC-10 Electrical Maintenance” in November.
  - This is in the schedule for no earlier than week 45 and will be negotiated in the Mid-Range negotiation meetings.

Additional time is being requested

- Two 8 hour complex downtimes in December 2008 for cutover, final connection and testing of the new G86 Substation, Mars Site.
- Fourteen 4 hour periods between July 2009 and January 2010 for testing of G86 Substation, Mars Site.

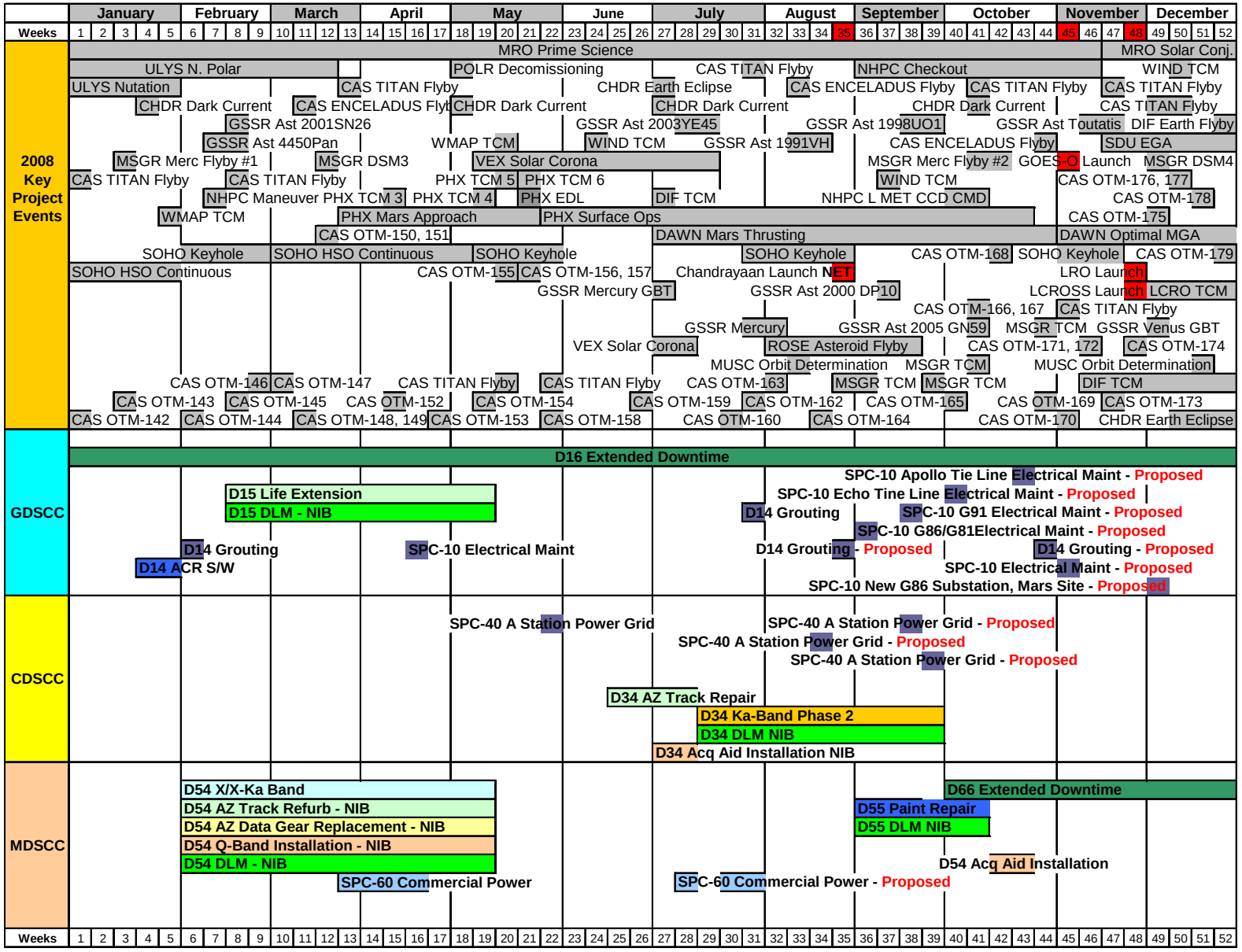
Antenna Downtime Status and Forecast

The following proposals for antenna downtimes are requested.

- MDSCC Annual Antenna Inspections including Annual Servo Testing at DSS-63, -65, -54 and -55 as follows:
  - **Servo Testing for DSS-55 is scheduled for DOY 192/0600-1400 week 28**
  - **Servo Testing for DSS-63 is scheduled for DOY 193/0600-1400 week 28**
  - **Servo Testing for DSS-54 is scheduled for DOY 196/0600-1400 week 29**
  - **Servo Testing for DSS-65 is scheduled for DOY 199/0600-1400 week 29**
  - **Servo Testing for DSS-63 is scheduled for DOY 203/0600-1400 week 20 (will be deleted if week 28 is negotiated)**
  - **Antenna Inspection for DSS-63 is scheduled for DOY 154/0600-1400 week 23**
  - **Antenna Inspection for DSS-55 is scheduled for DOY 161/0600-1400 week 24**
  - **Antenna Inspection for DSS-54 is scheduled for DOY 162/0600-1400 week 24**
  - **Antenna Inspection for DSS-65 is scheduled for DOY 163/0600-1400 week 24**

- HEF Transmitter Manifold Installation at DSS-15, -45 and -65 between July, 2008 and June 2009 not to be scheduled concurrently with DSS-15 being scheduled first.

Antenna Downtime Status and Forecast 2008

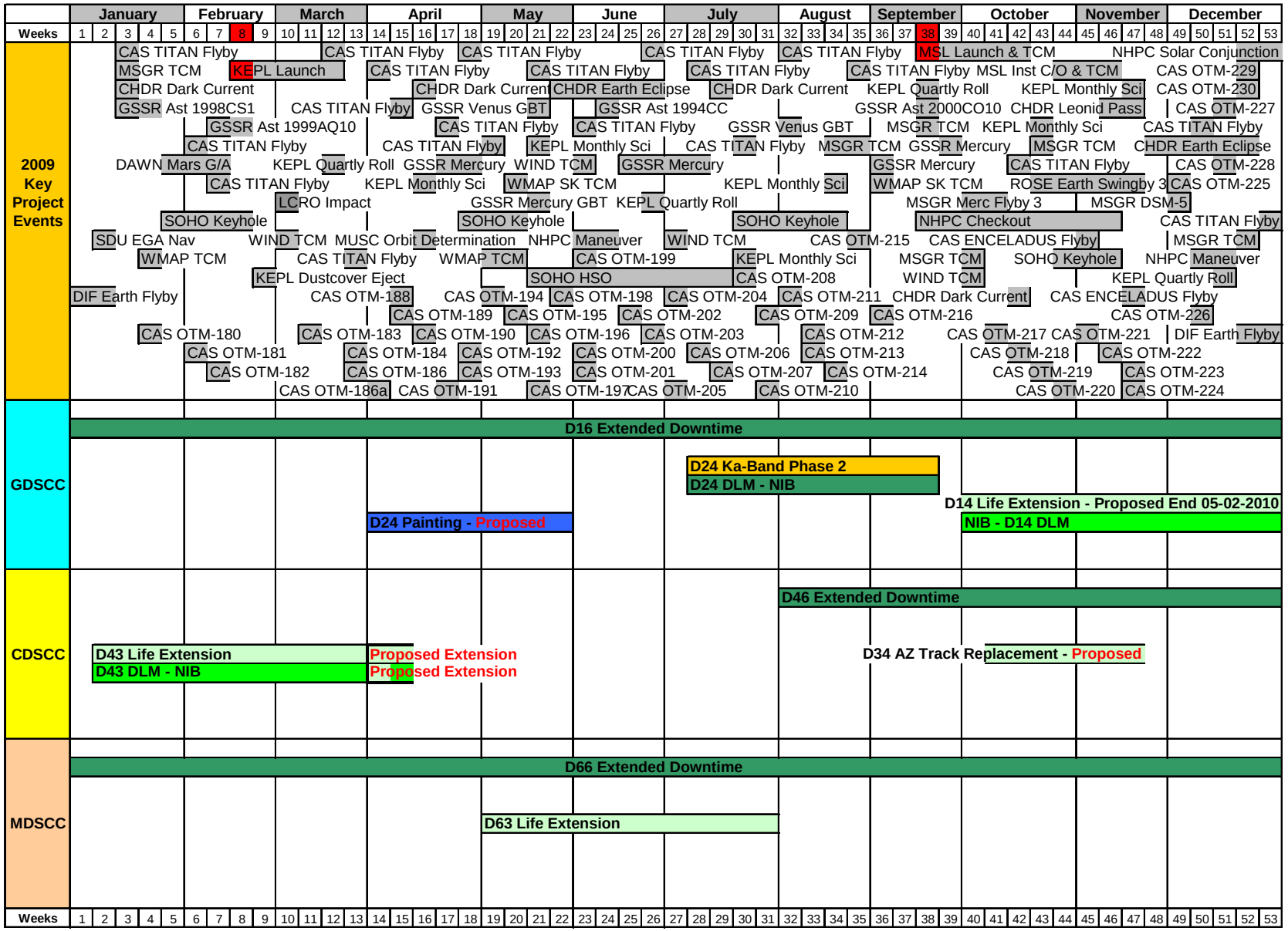


Revised: May 15, 2008

DSN Major Downtimes by Date
2008

2008							
Site	**Description**	**Start**	**End**	**Duration (Days)**	**Weeks**	**Start DOY**	**End DOY**
DSS 54	X/X-Ka Band Install	02/04/2008 00:00	05/11/2008 23:59	98	06 - 19	035	132
DSS 54	AZ Track Refurbishment - NIB	02/04/2008 00:00	05/11/2008 23:59	98	06 - 19	035	132
DSS 54	AZ Data Gear Replacement - NIB	02/04/2008 00:00	05/11/2008 23:59	98	06 - 19	035	132
DSS 54	Q-Band Installation - NIB	02/04/2008 00:00	05/11/2008 23:59	98	06 - 19	035	132
DSS 54	Depot Level Maintenance - NIB	02/04/2008 00:00	05/11/2008 23:59	98	06 - 19	035	132
DSS 15	Life Extension	02/18/2008 00:00	05/11/2008 23:59	84	08 - 19	049	132
DSS 15	Depot Level Maintenance - NIB	02/18/2008 00:00	05/11/2008 23:59	84	08 - 19	049	132
SPC 40	A STA Power Grid	06/02/2008 08:00	06/02/2008 12:00	0	23 - 22	154	153
DSS 34	AZ Track Repair	06/17/2008 00:00	07/13/2008 23:59	27	25 - 28	169	195
DSS 34	Acq Aid Installation - NIB	06/30/2008 00:00	07/13/2008 23:59	14	27 - 28	182	195
DSS 34	Ka-Band Phase 2 Install	07/14/2008 00:00	09/29/2008 23:59	77	29 - 39	196	272
DSS 34	Depot Level Maintenance - NIB	07/14/2008 00:00	09/29/2008 23:59	77	29 - 39	196	272
DSS 14	Grouting	07/29/2008 00:00	08/03/2008 23:59	6	31 - 31	211	216
SPC 60	Commercial Power Installation - Proposed	08/08/2008 18:00	08/11/2008 06:00	3	32 - 32	221	223
SPC 60	Commercial Power Installation - Proposed	08/22/2008 18:00	08/25/2008 06:00	3	34 - 34	235	237
SPC 40	A STA Power Grid - Proposed	08/25/2008 08:00	08/25/2008 16:00	0	34 - 34	237	237
DSS 14	Grouting - Proposed	08/27/2008 00:00	08/29/2008 23:59	3	35 - 35	240	242
SPC 60	Commercial Power Installation - Proposed	08/29/2008 18:00	09/01/2008 06:00	3	35 - 35	242	244
DSS 55	Paint Repair	09/01/2008 00:00	10/12/2008 23:59	42	36 - 41	245	286
DSS 55	Depot Level Maintenance - NIB	09/01/2008 00:00	10/12/2008 23:59	42	36 - 41	245	286
SPC 10	G86/G81 Electrical Maintenance	09/01/2008 08:30	09/01/2008 22:30	0	36 - 36	245	245
SPC 10	G91 Electrical Maintenance	09/15/2008 08:30	09/15/2008 22:30	0	38 - 38	259	259
SPC 40	A STA Power Grid - Proposed	09/22/2008 08:00	09/22/2008 14:00	0	39 - 39	266	266
SPC 40	A STA Power Grid - Proposed	09/29/2008 08:00	09/29/2008 14:00	0	40 - 40	273	273
DSS 66	Extended Downtime	09/29/2008 16:00	12/31/2019 23:59	4111	40 - 53	273	365
SPC 10	Echo Tie Line Electrical Maintenance	10/01/2008 08:30	10/01/2008 22:30	0	40 - 40	275	275
DSS 54	Acq Aid Installation	10/13/2008 00:00	10/16/2008 23:59	4	42 - 42	287	290
DSS 54	Acq Aid Installation	10/18/2008 00:00	10/21/2008 23:59	4	42 - 43	292	295
SPC 10	Apollo Tie-Line Electrical Maintenance	10/20/2008 08:30	10/20/2008 22:30	0	43 - 43	294	294
SPC 10	SPC-10 Electrical Maintenance	11/03/2008 08:30	11/03/2008 22:30	0	45 - 45	308	308
DSS 14	Grouting Proposed	11/05/2008 00:00	11/07/2008 11:59	2	45 - 45	310	311

Antenna Downtime Status and Forecast 2009

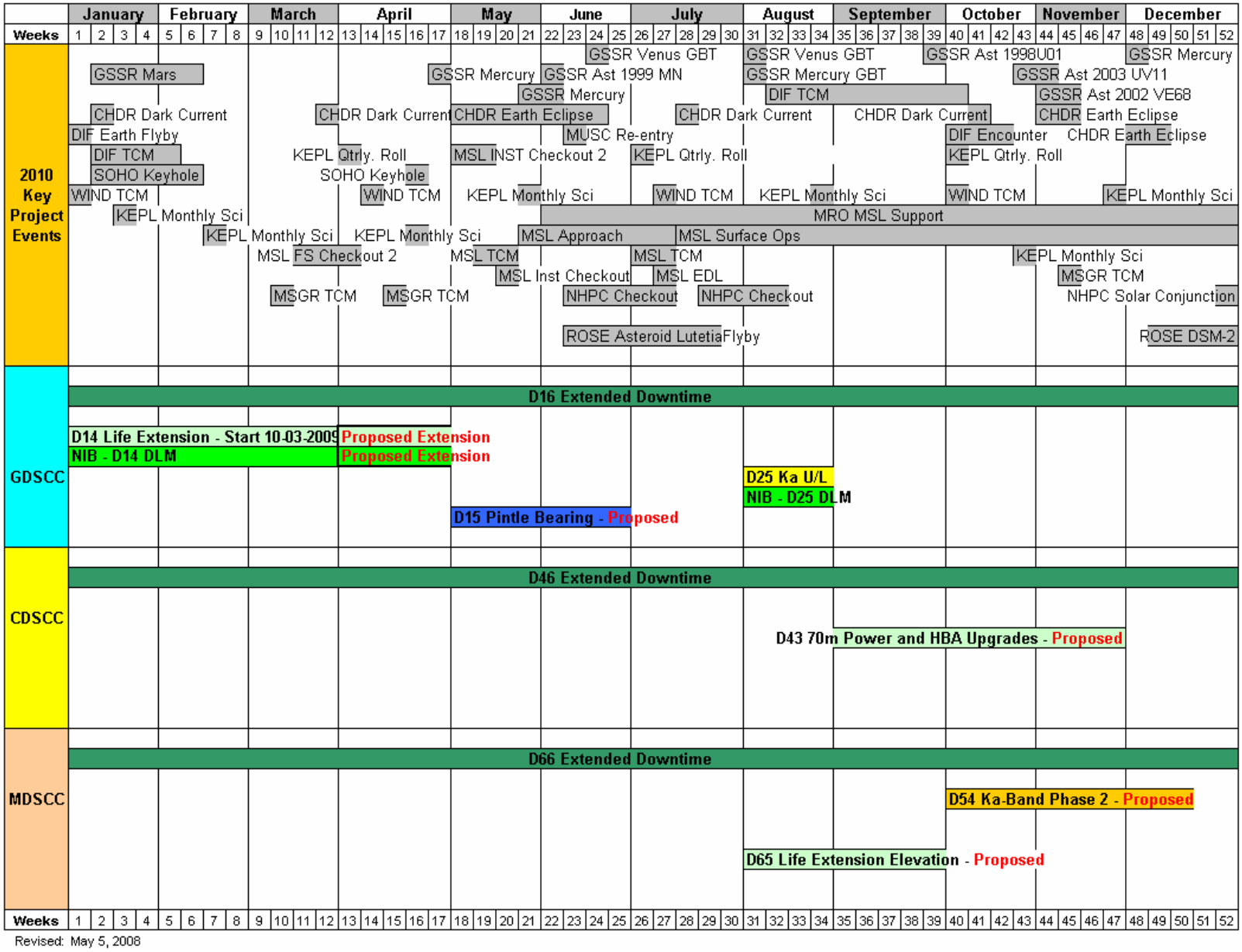


Revised: May 15, 2008

DSN Major Downtimes by Date
2009

2009							
Site	Description	Start	End	Duration (Days)	Weeks	Start DOY	End DOY
DSS 43	Life Extension	01/05/2009 00:00	03/29/2009 23:59	84	02 - 13	005	088
DSS 43	Depot Level Maintenance – NIB	01/05/2009 00:00	03/29/2009 23:59	84	02 - 13	005	088
DSS 43	Life Extension Addition - Proposed	03/30/2009 00:00	04/12/2009 23:59	14	14 - 15	089	102
DSS 43	Depot Level Maintenance Addition - Proposed	03/30/2009 00:00	04/12/2009 23:59	14	14 - 15	089	102
DSS 24	Painting - Proposed	03/30/2009 00:00	05/31/2009 23:59	63	14 - 22	089	151
DSS 63	Life Extension	05/04/2009 00:00	08/02/2009 23:59	91	19 - 31	124	214
DSS 24	Ka-Band Phase 2 Install	07/06/2009 00:00	09/21/2009 23:59	77	28 - 38	187	263
DSS 24	Depot Level Maintenance - NIB	07/06/2009 00:00	09/21/2009 23:59	77	28 - 38	187	263
DSS 46	Extended Downtime	08/03/2009 16:00	12/31/2019 23:59	3803	32 - 53	215	365
DSS 14	Life Extension	10/03/2009 00:00	03/28/2010 23:59	177	40 - 12	276	087
DSS 14	Depot Level Maintenance - NIB	10/03/2009 00:00	03/28/2010 23:59	177	40 - 12	276	087
DSS 34	AZ Track Replacement - Proposed	10/05/2009 00:00	11/22/2009 23:59	48	41 - 47	278	325

Antenna Downtime Status and Forecast 2010

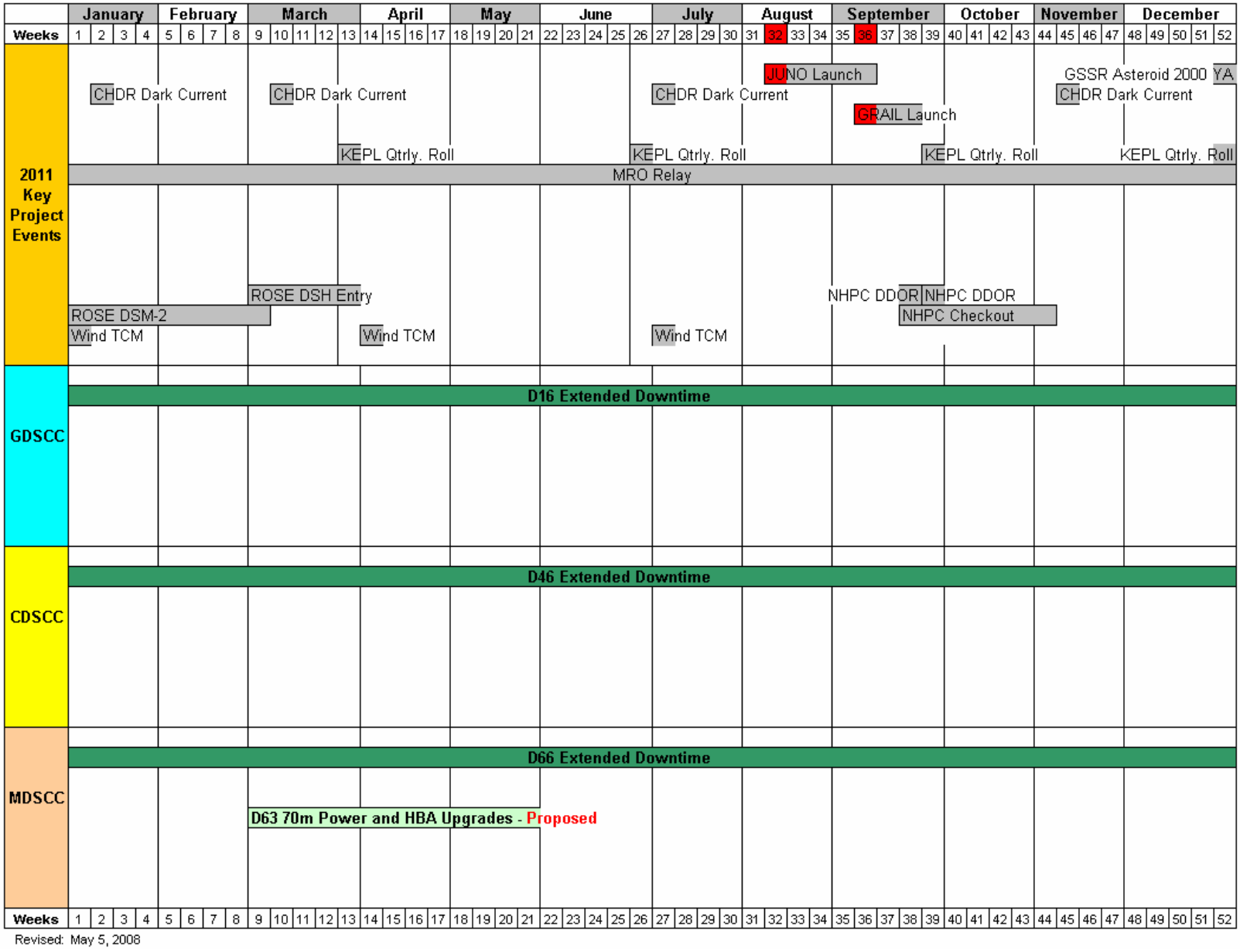


Revised: May 5, 2008

DSN Major Downtimes by Date
2010

2010							
Site	Description	Start	End	Duration (Days)	Weeks	Start DOY	End DOY
DSS 25	Ka-Band Uplink Install	03/29/2010 00:00	04/18/2010 23:59	21	13 - 15	088	108
DSS 25	Depot Level Maintenance - NIB	03/29/2010 00:00	04/18/2010 23:59	21	13 - 15	088	108
DSS 14	Life Extension Addition - Proposed	03/29/2010 00:00	05/02/2010 23:59	35	13 - 17	088	122
DSS 14	Depot Level Maintenance Addition - Proposed	03/29/2010 00:00	05/02/2010 23:59	35	13 - 17	088	122
DSS 15	Pintle Bearing - Proposed	05/31/2010 00:00	07/25/2010 23:59	56	22 - 29	151	206
DSS 25	Depot Level Maintenance - NIB	08/02/2010 00:00	08/29/2010 23:59	28	31 - 34	214	241
DSS 65	Life Extension Elevation - Proposed	08/02/2010 00:00	10/04/2010 23:59	63	31 - 39	214	276
DSS 25	Ka-Band Uplink Install	08/02/2010 00:00	08/29/2010 23:59	28	31 - 34	214	241
DSS 43	70m Power and HBA Upgrades - Proposed	08/30/2010 00:00	11/28/2010 11:59	90	35 - 47	242	331
DSS 54	Ka-Band Phase 2 Install - Proposed	10/04/2010 00:00	12/20/2010 23:59	77	40 - 50	277	353

Antenna Downtime Status and Forecast 2011



Revised: May 5, 2008

DSN Major Downtimes by Date
2011

2011							
Site	Description	Start	End	Duration (Days)	Weeks	Start DOY	End DOY
DSS 63	70m Power and HBA Upgrades - Proposed	02/28/2011 00:00	05/29/2011 23:59	90	09 - 21	059	148

Antenna Downtime Status and Forecast

DSN Resource Implementation Planning Matrix by Subnet

Complex	Station	Subnet	S-Band		X-Band		Ka-Band		Ka Phase 2
			Down	Up	Down	Up	Down	Up	
10	DSS-16	26M	✔	N/A	N/A	N/A	N/A	N/A	N/A
40	DSS-46	26M	✔	✔	N/A	N/A	N/A	N/A	N/A
60	DSS-66	26M	✔	✔	N/A	N/A	N/A	N/A	N/A
10	DSS-27	34HSB	✔	✔	N/A	N/A	N/A	N/A	N/A
10	DSS-24	34B1	✔	✔	✔	✔	N/A	N/A	09/21/09
40	DSS-34	34B1	✔	✔	✔	✔	✔	N/A	09/29/08
60	DSS-54	34B1	✔	✔	✔	✔	04/15/08	N/A	09/27/10
10	DSS-25	34B2	N/A	N/A	✔	✔	✔	08/01/10	N/A
10	DSS-26	34B2	N/A	N/A	✔	✔	✔	N/A	N/A
60	DSS-55	34B2	N/A	N/A	✔	✔	✔	N/A	N/A
10	DSS-15	34HEF	✔	N/A	✔	✔	N/A	N/A	N/A
40	DSS-45	34HEF	✔	06/01/08	✔	✔	N/A	N/A	N/A
60	DSS-65	34HEF	✔	06/01/08	✔	✔	N/A	N/A	N/A
10	DSS-14	70M	✔	✔	✔	✔	N/A	N/A	N/A
40	DSS-43	70M	✔	✔	✔	✔	N/A	N/A	N/A
60	DSS-63	70M	✔	✔	✔	✔	N/A	N/A	N/A

N/A = Capability Not Planned xx/xx/xx = Capability Date Recently Changed As of: 02/07/08

✔ ✔ ✔ = Capability Recently Exists ✔ = Capability Exists